

Myxomycetes in the Pantanal biome: first records and a new associate, *Attalea phalerata*

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ABSTRACT—The occurrence of myxomycetes is reported for the first time in the Brazilian Pantanal and on *Attalea phalerata* (acuri palm). The records are based on sporocarp collections made in the municipality of Poconé, State of Mato Grosso, in an area characterized by seasonal hydrological fluctuations and naturally open areas. We report six species: *Arcyria obvelata*, *Perichaena depressa*, and *P. vermicularis* (Trichiaceae); and *Physarum album*, *P. compressum*, and *P. polycephalum* (Physaraceae), all of which represent new records for the Pantanal and a new substrate, *A. phalerata*.

KEYWORDS—geographic distribution, *Mycetozoa*, myxobiota

Introduction

The Pantanal is considered the largest floodplain in the world (>140,000 km²). It is located in the central region of South America, extended in Bolivia, Paraguay, and Brazil. Considered the smallest Brazilian biome, the Pantanal lies in the Central-West region of the country in the States of Mato Grosso and Mato Grosso do Sul (Prance & Schaller 1982, Ribeiro & Dias 2007). According to the Köppen classification, its climate is AW: predominantly tropical with hot humid summers and cold dry winters, with annual temperature and precipitation averaging 25 °C and 140 cm (Signor & al. 2010, Alvares & al. 2013). The floods vary between permanent and

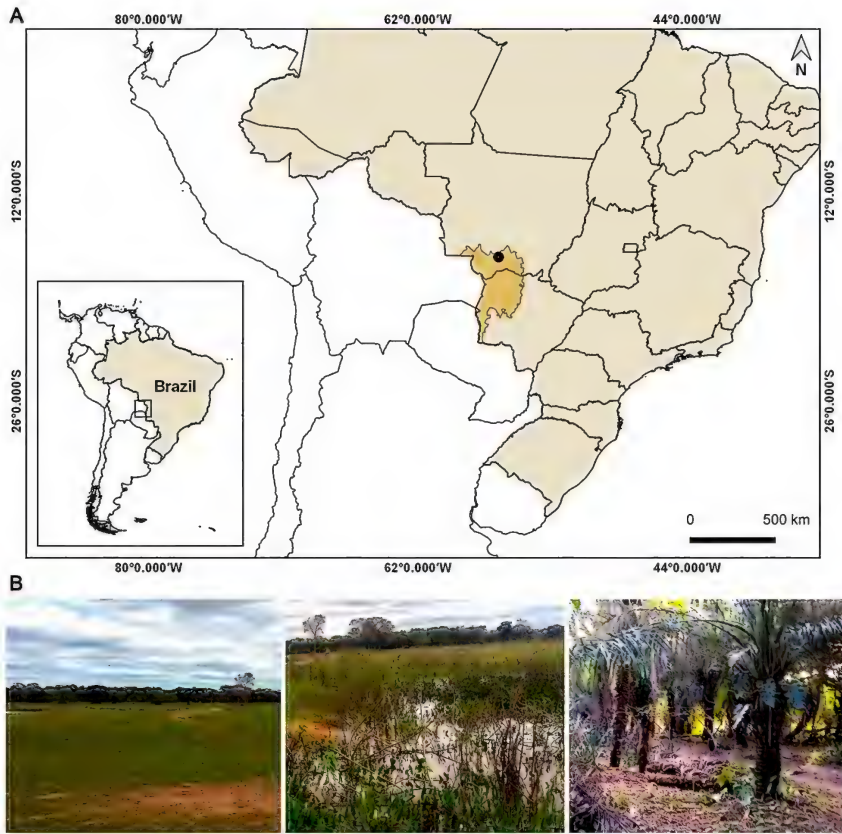


FIG. 1.A. Location of the Poconé sampling area (black dot) in South America and in the Brazilian Pantanal (yellow area). B. Some landscapes from the Poconé sampling area.

temporary, dependent upon topographical characteristics, soil composition and regulated by the climate (Rodela & Neto 2007). The vegetation comprises grass fields, forests, and aquatic plants (Prance & Schaller 1982, Ribeiro & Dias 2007).

The biome is biologically highly diverse. Its location in a region where different phytogeographic provinces (the Cerrado, Paraguayan Chaco, and Amazon and Meridional forests) converge, results in its functioning as a biogeographic corridor (PAE 2004). However, despite this rich diversity of ecosystems, most of the Pantanal biodiversity, and particularly the microbiota, is still unknown (Maia & al. 2015, Cavalcanti 2019).

Among these microorganisms, the myxomycetes (*Protozoa: Amoebozoa*) are prominent. These heterotrophic eukaryotes, characterized by at least two very distinct phases in their life cycle (Adamonytė & al. 2013, Eliasson 2013, Stephenson & Rojas 2017) can be found in a variety of habitats where food and humidity are available. They occur in different plant associations with different macromycetes (Andrade & al. 2006, Rufino & Cavalcanti 2007, Araújo & al. 2012).

In Brazil, myxomycete studies have been concentrated in the Northeast region, especially in the Atlantic forest and Amazon biomes (Cavalcanti 2019). Recently, those studies have been expanded to other biomes, such as the Cerrado, in the Central-West region (Xavier-Santos & al. 2016) and the Pampas, in the South region (Lima & Cavalcanti 2017). However, there is no record of myxobiota in the Pantanal. Here we present the first records of myxomycetes in this biome, as well as the first occurrence associated with *Attalea phalerata* Mart. ex Spreng. (*Arecaceae*).

Materials & methods

During July 2018, we opportunistically sampled around Km 10 of the Transpantaneira road in the municipality of Poconé, State of Mato Grosso (16°22'43"S 56°37'19"W) (FIG. 1A). The area is characterized by seasonal hydrological fluctuations and naturally open areas (FIG. 1B). The region climate is tropical hot and humid, with an average annual temperature of 25°C (Silva 2010). We identified the sampled material using micro- and macroscopic characters following a morphological species concept. We use the taxonomic nomenclature established by Lado (2019) and, follow the criteria used by Leontyev & al. (2019) for genus and family classifications. Specimen vouchers studied were deposited in the myxomycete collection of the herbarium of the Universidade Estadual de Goiás, Anápolis, Brazil (HUEG).

Results

We report six species representing *Trichiaceae* (*Arcyria obvelata*, *Perichaena depressa*, *P. vermicularis*) and *Physaraceae* (*Physarum album*, *P. compressum*, *P. polycephalum*). These species were collected over litter and living bracts of *Attalea phalerata*. This palm species—popularly known as acuri, bacuri, or uricuri—dominates the Pantanal region where it is used for food, animal forage, and construction material (Mostacedo & Fredericksen 1999, Miranda & al. 2001). The palm trees *Acrocomia intumescens* Drude (macaúba), *Copernicia prunifera* (Mill.) H.E. Moore (carnaúba), *Mauritia flexuosa* L.f. (buriti), *Orbignya phalerata* Mart. [= *Attalea speciosa* Mart.] (babaçu), and *Elaeis guineensis* Jacq. (dendezeiro) have already been recorded as important substrates for the myxobiota in Brazil (Alves & Cavalcanti 1996, Silva & al.

2010). However, this is the first Brazilian record of myxomycetes occurring on *Attalea phalerata*.

Taxonomy

Arcyria obvelata (Oeder) Onsberg, Mycologia 70(6): 1286. 1979. FIG. 2A

Sporocarps densely clustered, yellow. Stalk yellowish brown, slightly curved. Peridium persistent at base as a small shallow calyculus. Capillitia abundant, elastic, decorated with spines and half-rings. Spores yellow, 6.0–7.5 µm diam.

SUBSTRATE: Spathe (bract) of *Attalea phalerata*.

MATERIAL EXAMINED: BRAZIL. MATO GROSSO: Poconé, Km 10 of the Transpantaneira road, 10/VII/2018, S. Xavier-Santos 6452 (HUEG 11943); S. Xavier-Santos 6459 (HUEG 11953).

REMARKS: *Arcyria obvelata* is diagnosed by its long, cylindrical, yellow sporotheca and a capillitium only slightly connected to the epicalyx. This first record for the Central-West region establishes the species as present in all regions of Brazil. Previously reported on leaves of the *Copernicia prunifera* (Mobin & Cavalcanti 2000), this is the first record of *A. obvelata* on *Attalea phalerata* in the country.

DISTRIBUTION: Cosmopolitan (Martin & Alexopoulos 1969, GBIF 2019).

Perichaena depressa Lib., Pl. Crypt. Arduenna 4: no. 378. 1837. FIG. 2B

Sporocarp sessile, strongly flattened. Peridium double, partially iridescent, outer surface reddish brown and inner layer yellow, dehiscence circumsessile (as a lid formed from the top of the peridium and a base part as a shallow glass). Spores in mass dark yellow. Capillitia elastic, abundant, yellow, slightly warty. Spores yellow pale, minutely warty, 8.0–10.4 µm diam.

SUBSTRATE: Leaf litter.

MATERIAL EXAMINED: BRAZIL. MATO GROSSO: Poconé, Km 10 of the Transpantaneira road, 10/VII/2018, S. Xavier-Santos 6453 (HUEG 11954).

REMARKS: *Perichaena depressa* is easily recognized in the field due to the rapid formation of sporocarp and circumsessile dehiscence (Ukkola & Härkönen 1996). Widely distributed, it is the most frequent *Perichaena* species registered in Brazil.

DISTRIBUTION: Cosmopolitan (Martin & Alexopoulos 1969, GBIF 2019).

Perichaena vermicularis (Schwein.) Rostaf.,
Sluzowce Monogr., Dodatek: 34. 1876.

FIG. 2C

Plasmodiocarp ring-shaped, peridium double, ochraceous yellow, dehiscence irregular, persistent at the base; inner layer membranous, papillose.



FIG. 2. Myxomycetes recorded in the Brazilian Pantanal. A. *Arcyria obvelata*; B. *Perichaena depressa*; C. *Perichaena vermicularis*; D. *Physarum album*; E. *Physarum compressum*; F. *Physarum polycephalum*. Scale bars = 0.5 mm.

Capillitia decorated with small spinules, 9.0–12.5 µm diam.

SUBSTRATE: Spathe (bract) of *Attalea phalerata*.

MATERIAL EXAMINED: BRAZIL. MATO GROSSO: Poconé, Km 10 of the Transpantaneira road, 10/VII/2018, S. Xavier-Santos 6454 (HUEG 11945); S. Xavier-Santos 6460 (HUEG 11949).

REMARKS: *Perichaena vermicularis* was previously reported in Brazil's Northeast and Southeast regions plus one record from the Midwest area. This is the first Brazilian record of the species occurring on *Attalea phalerata*.

DISTRIBUTION: Cosmopolitan (Martin & Alexopoulos 1969, GBIF 2019).

Physarum album (Bull.) Chevall., Fl. Gén. Env. Paris 1: 336. 1826. FIG. 2D

Sporocarps grouped. Peridium covered by calcareous granules, grayish white, petaloid dehiscence. Stalk, blackish brown base, curved. Spores in dark brown mass. Capillitia hyaline, interconnected by fusiform white calcareous granules. Spores violet brown, moderately warty, 8.0–9.5 µm diam.

SUBSTRATE: Spathe (bract) of *Attalea phalerata*.

MATERIAL EXAMINED: BRAZIL. MATO GROSSO: Poconé, Km 10 of the Transpantaneira road, 10/VII/2018, S. Xavier-Santos 6455 (HUEG 11942); S. Xavier-Santos 6461 (HUEG 11951).

REMARKS: Key characters of *Physarum album* are its pendant sporocarp and blackish brown pedicel that becomes white near the apex. This species has already been found on leaves of *Elaeis guineensis* (Silva & al. 2010); this is the first Brazilian record on *Attalea phalerata*.

DISTRIBUTION: Cosmopolitan (Martin & Alexopoulos 1969, GBIF 2019).

Physarum compressum Alb. & Schwein., Consp. Fung. Lusat.: 97. 1805. FIG. 2E

Sporotheca with rounded lobes. Stalk short, dark brown (almost black). Capillitia with irregular nodules. Spores dark, 9.0–13.5 µm diam.

SUBSTRATE: Spathe (bract) of *Attalea phalerata*.

MATERIAL EXAMINED: BRAZIL. MATO GROSSO: Poconé, Km 10 of the Transpantaneira road, 10/VII/2018, S. Xavier-Santos 6456 (HUEG 11946); S. Xavier-Santos 6462 (HUEG 11952).

REMARKS: *Physarum compressum* is characterized by its fan-shaped or flabelliform sporotheca that dehisce by an apical or irregular cleft and the presence of calcium granules after opening. This is the first record for the Central-West region. This species has already been found on leaves of *Elaeis guineensis* (Silva & al. 2010); but this is the first Brazilian record on *Attalea phalerata*.

DISTRIBUTION: Cosmopolitan (Martin & Alexopoulos 1969, GBIF 2019).

Physarum polycephalum Schwein.,

Schriften Naturf. Ges. Leipzig 1: 63. 1822.

FIG. 2F

Sporocarps grouped. Sporotheca multilobed, compressed, umbilicate in the bottom, peridium simple, gray in the center and yellow on the border. Stalk long, brownish yellow. Spore mass dark brown. Capillitia dense, pale yellow, intertwined by pale yellow calcareous nodules. Spores globose, violaceous-brown, spinulose 7.0–9.0 µm diam.

SUBSTRATE: Spathe (bract) of *Attalea phalerata*.

MATERIAL EXAMINED: BRAZIL. MATO GROSSO: Poconé, Transpantaneira road, Pousada Piuval, 10/VII/2018, S. Xavier-Santos 6457 (HUEG 11948).

REMARKS: One prominent macroscopic character of *Physarum polycephalum* is its multilobed and compressed sporotheca that vary in color between yellow, gray, and bronze. This species is widely used as a biological model, due to its easy growth and manipulation in vitro, the rapid response of the plasmodium, migratory behavior, and attraction for food and humidity, among other factors (Adamatzky 2010, Bozzzone 2011). This is the first Brazilian report of its occurrence on *Attalea phalerata*.

DISTRIBUTION: Pantropical and Northern temperate zone (Martin & Alexopoulos 1969, Lado & Basanta 2008, Ndiritu & al. 2009, GBIF 2019).

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